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AEROSPACE MATERIAL SPECIFICATION

SAE AMS-T-6841

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Submitted for recognition as an American National Standard

Tape and Sheet, Adhesive, Rubber and Cork Composition

NOTICE

This document has been taken directly from U.S. Military Specification MIL-T-6841D, and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. The initial release of this document is intended to replace MIL-T-6841D. Any part numbers established by the original specification remain unchanged.

The original Military Standard was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, and (b) the use of the existing government specification or standard format.

Under Department of Defense policies and procedures, any qualification requirements and associated qualified products lists are mandatory for DOD contracts. Any requirement relating to qualified products lists (QPL's) has not been adopted by SAE and is not part of this technical report.

1. SCOPE:

1.1 Form:

This specification covers one type of tape and sheet for use in the installation of windshields, panels, and windows in cabins and cockpits of aircraft.

1.2 Application:

The tape and sheet are intended for use as a seal and packing for the installation of glass or acrylic plastic windshields, panels and windows in cabins and cockpit of aircraft.

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1.3 Safety-Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS:

The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

2.1 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

L-P-390	Plastic, Molding Material, Polyethylene, Low and Medium Density
NN-P-530	Plywood, Flat Panel
QQ-A-250/4	Aluminum Alloy 2024, Plate and Sheet
TT-T-291	Thinner, Paint, Volatile Spirits (Petroleum Spirits)
UU-P-268	Paper; Kraft, Untreated, Wrapping
MMM-A-260	Adhesive, Water-resistant (For Sealing Waterproof Paper)
PPP-B-601	Boxes, Wood, Cleated-Plywood
PPP-B-621	Boxes, Wood, Nailed and Lock-Corner
PPP-B-636	Box, Fiberboard
PPP-B-1055	Barrier Material, Waterproofed Flexible
PPP-T-45	Tape, Gummed Paper Reinforced & Plain, for Sealing & Securing
MIL-P-5425	Plastic Sheet, Acrylic, Heat Resistant
MIL-P-8184	Plastic Sheet, Acrylic, Modified
MIL-C-17564	Cloth, Holland
MIL-C-38736	Compound, Solvent, for Use in Integral Fuel Tanks
MIL-P-83310	Plastic Sheet, Polycarbonate, Transparent
MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B 21	Rod Naval Brass, Bar and Shapes

3. TECHNICAL REQUIREMENTS:

3.1 Materials and Construction:

The tape and sheet shall consist of a granulated cork uniformly dispersed in a synthetic rubber compound which shall be calendered on print cloth and vulcanized to meet the detail requirements of this specification. The cloth backing shall be coated with a thin film of pressure-sensitive adhesive, over which shall be applied Holland cloth or polyethylene.

3.1.1 Cork: The tape and sheet shall consist of uniformly dispersed cork particles in a synthetic rubber binder. The cork content shall be not less than 20 nor more than 25 percent by weight of the tape or sheet and shall be free of hardback and adulterants. The cork particles shall all pass through a 20-mesh sieve with not more than 10 percent passing through a 40-mesh sieve.

3.1.2 Backing: The backing shall consist of print cloth weighing approximately 3 ounces per square yard and having a thread count of not less than 60 by 60 inch in the warp and filling.

3.1.3 Adhesive: The adhesive shall be pressure sensitive and may contain either synthetic or natural rubber or any combination thereof, but shall not contain reclaimed rubber.

3.1.4 Holland cloth: The Holland cloth shall conform to MIL-C-17564.

3.1.5 Polyethylene: The polyethylene shall conform to type I, grade I, class M of L-P-390.

3.2 Data:

Unless otherwise specified in the contract or order, no data are required by this specification or any of the documents referenced in section 2 (see 8.1).

3.3 Surface finish:

The tape and sheet shall have a sanded finish and shall be as smooth as possible, consistent with the coarse character of the cork.

3.4 Size:

Unless otherwise specified by the procuring activity, tape shall be in rolls of 100 +2 feet in length, in thickness as specified in table IA and widths shall be as specified in table IB. Sheets sizes shall be as specified in table II and thickness as specified in table IA.

TABLE IA. Tolerances, Inch/Pound Units, Tape/Sheet

DASH	Thickness Inches +0.020 – 0.000	Weight lb/sq.yd ± 10 percent
1	.031 (1/32)	1-1/2
2	.062 (1/16)	2-1/2
3	.094 (3/32)	3-1/2
4	.125 (1/8)	4-1/2

TABLE IB. Width Tape

DASH	Inches ± 0.031 (1/32)
01	.250 (1/4)
02	.500 (1/2)
03	.750 (3/4)
04	1.000 (1)
05	1.250 (1-1/4)
06	1.500 (1-1/2)
07	2.000 (2)
08	2.500 (2-1/2)

TABLE II. Sheet Size

DASH	Inches + .250 - 0.000
1S	24 X 24
2S	36 X 36

3.5 Weight:

3.5.1 As received: The as-received weight of the tape or sheet shall include the weight of the Holland cloth or polyethylene, and shall be as specified in table IA, when tested as specified in 4.6.2.

3.5.2 After oven aging: The weight of the as-received sample as determined in 3.5.1 shall not vary by more than ±10 percent after oven aging (see 4.4.2), when tested as specified in 4.6.2.

3.6 Physical properties:

The physical properties shall conform to the requirements of table III based on tests made before removal of the Holland cloth or polyethylene (see 4.6.3 and 4.6.4).

TABLE III. Physical properties

Property	As received	After oven aging (see 4.3.2)
Compressibility (percent)	20-35	15-40
Recovery (percent) (min)	90	80
Low temperature resistance (percent) (min)	40	No requirement

3.7 Adhesive strength:

The adhesive shall not transfer to the Holland cloth or polyethylene, nor reveal bare spots when unrolled. When applied to an aluminum alloy panel, as specified in 4.6.5, it shall be capable of supporting a weight of 3 pounds per inch of width for a period of at least 1 minute.

3.8 Accelerated crazing:

The tape and sheet shall not contain ingredients that will cause MIL-P-8184 acrylic, MIL-P-5425 acrylic, or MIL-P-83310 polycarbonate plastic sheet to craze or crack when tested as specified in 4.6.6.

3.9 Identification of product:

Each roll of tape shall be marked or tagged, and each sheet shall be marked in a permanent and legible manner with the information specified in 5.3.

3.10 Water vapor transition rate:

The average water vapor transmission rate (WVTR) of the tape, when tested as specified in 4.6.7 shall not exceed 4.0 gms./100 sq inch/24 hours.

3.11 Workmanship:

The tape and sheet shall conform to the quality and grade of product established in this specification. Occurrence of defects shall not exceed the applicable quality levels.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

Unless otherwise specified in the contract or purchase order, the manufacturer shall supply all samples and shall be responsible for the performance of all tests. Except as otherwise specified in the contract or purchase order, the manufacturer may use their own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the purchaser. Purchaser reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure that the supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance: All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the manufacturer's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the manufacturer of the responsibility of ensuring that all products or supplies submitted to the purchaser for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements; however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the purchaser to accept defective material.

4.2 Classification of tests:

The inspection requirements specified herein are classified as quality conformance inspections (see 4.3).

4.3 Quality conformance inspection:

Samples shall be labeled completely with information identifying the purpose of the sample, name of product, specification number, lot number, date of sampling and contract number.

4.3.1 Inspection:

4.3.1.1 Inspection lot: A lot shall consist of all material manufactured in the same identifiable production period, by the same process under the same operating conditions, and submitted for manufacturer's inspection at one time.

4.3.1.2 Samples for quality conformance tests: The sample unit for each lot shall consist of 10 linear feet of tape, or 1 sheet. Two inch wide specimens shall be supplied for the water vapor transmission rate test. The inspection level for determining the sample size shall be S-1 of MIL-STD-105, except that not less than three sample units shall be randomly selected throughout the lot. The index level shall be 4.0 expressed in defects per 100 units. The lot size, for purpose of testing, shall be expressed in units of rolls or cut sheets, as applicable, of the specified width, length, and thickness.

4.3.2 Examination of component materials: In addition to conformance with quality assurance provision of any subsidiary specification, component material shall be examined as specified in table IV. In addition, the supplier shall furnish a certificate stating the cork content and adhesive conform to the requirements of 3.1.1 and 3.1.3, respectively. There shall be no evidence of failure to meet the requirements as applicable.

TABLE IV. Examination of component materials

Component and characteristic	Reference requirement	Requirements applicable to individual unit	Number determination per sample unit	Results reported as-		Sample Unit	Sample size
				Pass or fail[1]	Numerically to nearest[2]		
Cork						1 lb (compos-ite).	
20-mesh sieve	3.1.1		Average of 2 on Composite.		0.1 percent		
40-mesh sieve	3.1.1		Average of 2 on Composite.		0.1 percent		
Backing						2 ft.	3
Weight/sq yd	3.1.2	X	Average of 2	X	0.1 oz/sq yd		
Wrap	3.1.2	X	Average of 5	X			
Filling	3.1.2	X	Average of 5	X			

[1] If failure is indicated, report description of failure.
[2] Test reports shall include all values on which results are based.

4.3.3 Examinant of the end item: The tape and sheet shall be visually examined to determine conformance with the requirements of this specification with respect to appearance, workmanship, construction, and dimension. The lot size shall be expressed in units of rolls or sheets. Defects found during this examination shall be scored in accordance with 4.3.3.1 through 4.3.3.4.

4.3.3.1 Examination for defects in appearance and workmanship: For examination of defects of tape (rolls), the sample unit shall be 1 yard. For examination of sheets (Flat cut), the sample unit shall be 1 sheet. The index level for this examination shall be 1.5 defects per 100 units. The sample size shall be based on level 1 of MIL-STD-105. Both sides of the tape and sheet shall be examined and shall conform to the requirements of table V.

TABLE V. Defects in appearance and workmanship

Examine	Defect
Appearance	Any holes, tears, cuts, crack, or sharp creases. Imbedded particles of dirt, grit, or other foreign matter.
Workmanship	Not clean cut, broken, uneven or sticky edges. Adhesive coating not evenly and smoothly applied over entire area of one side of backing. Any bare spots or lumps.

4.3.3.2 Examination for defects in construction: The sample unit for this examination shall be 1 roll or 1 sheet, as applicable. The index for this examination shall be 2.5 defects per 100 units. The sample size shall be based on level S-3 of MIL-STD-105 and shall conform to the requirements of table VI.

TABLE VI. Defects in construction

Examine	Defect
Construction of tape and sheet	Not as specified.
Wind of tape unwinding of tape	Roll not evenly and neatly wound. Does not unroll evenly and uniformly. Backing breaks, delaminates or splits. Tape sticks together to the extent unrolling causes tearing or injury to surface or adhesive separate from backing. Roll not continuous.

4.3.3.3 Examination for dimensional defects: The sample unit for this examination shall be 1 roll or 1 sheet, as applicable. The index level for this examination shall be 2.5 defects per 100 units. The sample size shall be based on level S-2 of MIL-STD-105 and shall conform to the requirements of table VII.

TABLE VII. Defects in dimensions

Examine	Defect
Tape width	Varies by more than the plus or minus tolerances specified in table I
Sheet width and width	Varies by more than ± 1/8 inch from size specified in 3.4

4.3.3.4 Examination for length per roll: The sample unit for this examination shall be 1 roll. The index level for this examination shall be 4.0 defects per 100 units. The sample size shall be based on level S-2 of MIL-STD-105. The length per roll shall not vary by more than the plus or minus tolerance from the length specified.

4.3.4 Examination of preparation for delivery: An examination shall be made to determine that packaging, packing, and markings comply with sections 5 of this specification. The sample unit for this examination shall be one shipping container fully packed, selected just prior to the closing operations. Defects of closure listed herein shall be examined on shipping containers fully prepared for delivery. The lot size shall be the number of shipping containers in the end item inspection lots. The inspection level shall be S-2 and the index level shall be 4.0 defects per 100 units and shall conform to the requirements of table VIII.

TABLE VIII. Preparation for delivery

Examine	Defect
Packaging	Not the level specified; not in accordance with contract requirements.
	Packaging material not as specified, closures not accomplished by specified or required methods or materials.
	Not individually wrapped and sealed as specified.
Rolls Sheets	Paper interleaves omitted or not extending over full contact area between sheets.
	Not evenly or neatly stacked; stacks exceed 10 inches in height.
Packing	Not the level specified; not in accordance with contract requirements.
	Linear material (as applicable) omitted, damaged or not as specified.
	Container not as specified, closures not accomplished by specified or required methods or materials.
	Any nonconforming component; component missing, damaged or otherwise defective affecting serviceability.
	Inadequate application of components, such as incomplete closures of case liners, container flaps, loose or inadequate strapping, bulged or distorted containers.
Weight	Gross or net weight exceeds specified requirements.
Markings	Interior or exterior markings (as applicable) omitted, illegible, incorrect, incomplete or not in accordance with contract requirements.

4.4 Test conditions:

4.4.1 Atmospheric: Unless otherwise specified for the particular test, all tests shall be accomplished under standard atmospheric conditions 50 +2 percent relative humidity at a temperature of 23 ± 1°C (73 ±2°F). Samples shall be exposed to these conditions for at least 2 hours before testing.

4.4.2 Oven aging: Oven aging specimens shall be given an accelerated aging by subjecting them to dry circulating air for 70 ± 1 hours at 100 ± 1°C (212 ± 2°F).

4.5 Quality conformance:

Quality conformance tests for acceptance of individual lots shall consist of tests for all requirements specified in section 3 as listed in table IX.

TABLE IX. Quality conformance tests

Characteristic	Reference		Requirements applicable to individual units	Number of determinations per sample unit	Results reported as-	
	Requirement	Test Method			Pass or fail[1]	Numerically Nearest[2]
Thickness	3.4 & table IA	4.6.1	X	Average of 5		0.001 inch
Weight	3.5.1 & table IA	4.6.2	X	Average of 3		0.05 lb
Compressibility	Table III	4.6.3	X	Average of 2		Percent
Recovery	Table III	4.6.3	X	Average of 2		Percent
Low Temperature Resistance	Table III	4.6.4	X	Average of 3		Percent
Adhesive strength	3.7	4.6.5	X	3	X	
Accelerated erasing	3.8	4.6.6	X	2	X	

[1] If failure is indicated, report either description of failure or numerical point of failure, as applicable.
[2] Test reports shall include all values on which results are based.

4.6 Test methods:

4.6.1 Thickness: The thickness of samples shall be measured in not less than five areas and the average thickness computed from the results of the individual determinations. The gages employed shall have flat, parallel bearing surfaces 0.250+0.010, -0.000 inch in diameter at both contact areas, and the pressure exerted shall be 1/4 pound. The accuracy of measurement shall be 0.001 inch.

4.6.2 Weight: A specimen approximately 12 inches in length shall be cut from the sample. The width and length of the specimen shall be determined to the nearest 0.01 inch, and the weight determined with a balance to an accuracy of 1 percent. The weight per square yard shall be calculated from the test results.

4.6.3 Compressibility and recovery: Specimens 1 inch in diameter shall be cut and plied up at least 1/4 inch in thickness. The pieces shall be arranged in a single stack with edges even. The thickness of the combined samples shall be measured under an initial load 1 pound per sq. inch (psi), applied for 15 seconds. The stacked specimens shall be compressed under a load of 78.5 pounds for 5 minutes and the amount of compression recorded. The pressure shall be released for 5 minutes and another measurement made under a 1-pound load per square inch. The percent of compressibility and percent of recovery shall be calculated by the following formulas:

$$\text{Percent compressibility} = \frac{\text{Actual amount of compression in inches x 100}}{\text{Original thickness}} \quad \text{(Eq. 1)}$$

$$\text{Percent thickness of original after recovery} = \frac{\text{Thickness after 5 minutes x 100}}{\text{Original thickness}} \quad \text{(Eq. 2)}$$

$$\text{Formula to determine percent recovery: Percent recovery} = 100\,\frac{t_r - t_c}{t_o - t_c} \quad \text{(Eq. 3)}$$

Where:

t_o = original thickness
t_c = compressed thickness
t_r = recovered thickness

The apparatus for tests shall consist of a small load press, the platform and the presser foot, which shall be large enough to completely cover the sample under test. The moving head of the apparatus shall be equipped with suitable means for measuring thickness under the different compressions.

4.6.4 Low temperature resistance: Using a suitable testing machine, the load to compress a single layer specimen 25 percent shall be determined as 21° ± 3°C (70° ± 5°F). At least four equal weights shall be added at 1 minute ± 2 second intervals until at least 25 percent compression is obtained. The test shall be run in triplicate and results averaged. A single layer specimen shall be conditioned in cold chamber for 5 hours at -40°C ± 1°C (-40° ± 2°F). At the end of conditioning period, the load which compressed the material 25 percent at room temperature shall be applied to the specimen in the cold chamber and the amount of compression recorded. At least four equal weights shall also comprise the load and the weights added at 1 minute +2 second intervals. This test shall be conducted in triplicate and results averaged. Low temperature resistance in percent shall be calculated as follows:

$$\text{Low temperature resistance (percent)} = \frac{\text{Percent compression at -40°±1°C (-40°±2°F) under load produced 25 percent compression at 21°+3°C(70°+5°F) x 100}}{25} \quad \text{(Eq. 4)}$$

4.6.5 Adhesive strength: A test specimen 1 inch wide by 3 inches long shall be aged at 70° ± 1°C (158° ± 2°F) for 7 days in a circulating hot air oven. The specimens shall be allowed to rest 24 hours after removal from the oven before testing. A highly polished aluminum alloy panel conforming to QQ-A-250/4 (2024) shall be cleaned before the test by wiping with a cotton cloth soaked in cleaner conforming to MIL-C-38736 followed by wiping with a methyl alcohol soaked cloth. The panel shall be allowed to dry thoroughly before applying the test specimen. The Holland cloth or polyethylene shall be removed from the test specimen immediately before applying the tape or sheet to the polished panel. The tape and sheet shall be so applied that 2 inches are in contact with the panel allowing an overhang of 1 inch. The specimen shall be pressed on a panel by rolling a 5 pound weight over the tape and sheet once in each direction. Care should be taken that the 1 inch overhang is not pressed to the supporting surface. After the specimen is applied to the panel, the panel shall be supported in a vertical position and a 3 pound weight suspended from the 1 inch overhang of the tape and sheet by means of a suitable clip, so that the weight is supported by the adhesive acting in shear. The weight shall be applied gradually so that the tape and sheet are not subject to impact loading. The test shall be run in triplicate.

4.6.6 Accelerated crazing: Crazing shall be tested against MIL-P-8184 acrylic, MIL-P-5425 acrylic, and MIL-P-83310 polycarbonate. Two adjoining specimens, each 1 by 7 inches, shall be cut from the sheet of plastic to be tested and shall be cleaned with aliphatic naptha or any other suitable cleaner. The pieces shall be set up as cantilever beams as shown on figure 1, in a circulating air oven maintained at a temperature of 43° ± 1°C (110° ± 2°F) for 24 hours. The beams shall be loaded to produce an outer fiber tensile stress of 2000 psi at the support. The adhesive surface of 1-by 2-inch specimen, with the Holland cloth or polyethylene removed, shall be placed in intimate contact with one of the beams directly over the support. The specimen shall be held in firm contact with the surface of the plastic by applying a small load (3 ounce shot bag) on top of the specimen. The other beam under a similar stress without test specimen shall be employed as control. The examination for crazing shall be made while the plastic is under stress at the end of the 24 hour test period. Stresses shall be calculated from the following beam formula, based on the 2:4 beam ratio.

$$F = \frac{24L}{WT^2} \qquad \text{(Eq. 5)}$$

L = Load in pounds (applied at free end of beam - 4 inches from support
W = Width of plastic in inches
T = Thickness of plastic in inches
F = Maximum outer fiber tensile stress directly over support

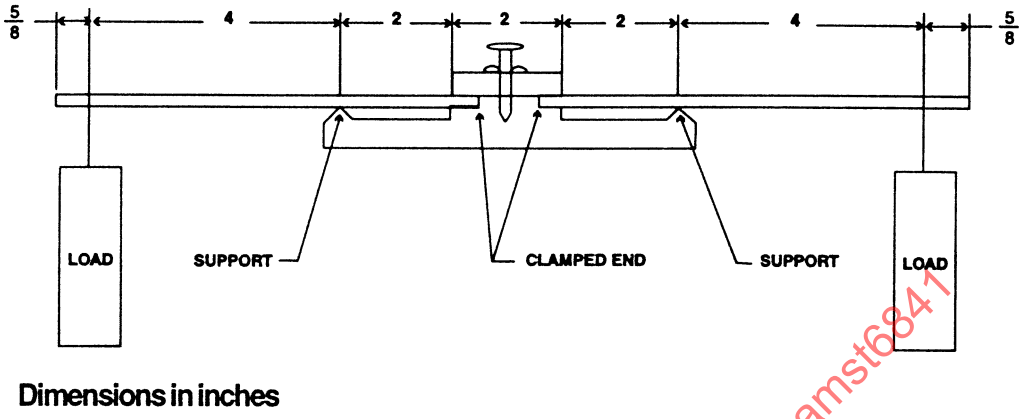

FIGURE 1. Diagrammatic sketch-head of crazing test apparatus with plastic strips in place

4.6.7 Water vapor transmission rate (WVTR):

4.6.7.1 Apparatus:

4.6.7.1.1 Humidity: The humidity cabinet to be used in this test is standard equipment known as the General Foods moisture vapor transmission cabinet, or equivalent. It shall provide a relative humidity of 90 to 95 percent at a temperature of 38° ± 1°C (100° ± 2°F) with no condensation on the test dishes or in the space in which the test dishes are placed. The circulation over the test dishes shall be negligible.

4.6.7.1.2 Test dishes: The test dishes shall be flat, rigid, flanged rectangular cups formed of brass conforming to ASTM B 21 (approximately 24 gage) and shall have the dimensions shown below:

Flange: Outside dimensions: 6 by 2 inches
Inside dimensions (opening): 4 by 1 inch

Body: Inside dimensions 4 by 1 by 1-1/2 inches deep

The weight of the test dishes shall not exceed 100 grams